REPLY UNDER 37 CFR 1.116
EXPEDITED PROCEDURE
TECHNOLOGY CENTER 1700
Docket No. 0091.1032

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Ji Yong PARK et al.

Application No. 10/690,507 Group Art Unit: 1792

Confirmation No. 6043

Filed: October 23, 2003 Examiner: Matthew J. Song

For: METHOD FOR MANUFACTURING POLYCRYSTALLINE SILICON THIN FILM AND THIN FILM TRANSISTOR FABRICATED USING POLYCRYSTALLINE SILICON THIN FILM MANUFACTURED BY THE MANUFACTURING METHOD

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is in response to the Final Office Action mailed January 26, 2009, and having a period for response set to expire on April 26, 2009.

Pursuant to 1296 OG 67 and 1303 OG 21, the applicants request review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a Notice of Appeal.

The review is requested for the reasons set forth on the following pages, of which only five pages (i.e., pages 2-6) are arguments as required by section (3)(b) of 1296 OG 67. Page 7 is a signature page.

REMARKS

Claims 1, 3, 6, 7, 10, and 13 are pending, with claims 1, 6, and 13 being independent.

Claims 1, 3, 6, 7, 10, and 13 have been rejected under 35 USC 103(a) as being unpatentable over Im et al. (Im) (WO 01/18854) in view of Jung (U.S. Patent No. 6,475,872).

However, it is submitted that Im and Jung do not disclose or suggest the following feature of independent claims 1, 6, and 13:

> wherein an average width of polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is greater than approximately 0.2 μm and not greater than approximately 0.6 μm, and decreases as the width of the overlapped portion of the first polycrystalline silicon region decreases.

The Examiner states as follows on page 4 of the Final Office Action of January 26, 2009:

> The combination of Im et al [*sic*] and Jung does not teach the average width of the polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is greater than approximately 0.2 μm and not greater than approximately 0.6 μm and decreases as the width of the overlapped portion of the first polycrystalline silicon region increases. The combination of Im et al [*sic*] and Jung teaches an overlapped portion of 1 μm, which applicant teaches produces grain widths within the claimed range and overlapping more than 0.5 μm produces average grain widths of 0.2 μm or more, note applicant's Figure 3 and paragraph [0031]; therefore the claimed grain widths are expected.

However, the Examiner has not explained how the combination of Im and Jung proposed by the Examiner provides the feature "wherein an average width of polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region . . . decreases as the width of the overlapped portion of the first polycrystalline silicon region decreases" recited in claims 1, 6, and 13. The Examiner has not even alleged that the combination of Im and Jung proposed by the Examiner provides this feature. The Examiner has merely explained why he considers the combination of Im and Jung proposed by the Examiner to provide the feature "wherein an average width of polycrystalline silicon grains of the second polycrystalline silicon region

measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is greater than approximately 0.2 μm" recited in claims 1, 6, and 13. Accordingly, it is submitted that the Examiner has not established a *prima facie* case of obviousness with respect to claims 1, 6, and 13 and claims 3, 7, and 10 depending from claims 1 and 6.

Furthermore, it is submitted that Im and Jung do not disclose or suggest the following feature of claims 1, 6, and 13:

> wherein a width of the overlapped portion of the first polycrystalline silicon region measured perpendicularly to a boundary between the exposed portion of the amorphous silicon layer and the overlapped portion of the first polycrystalline silicon region is always greater than 0.5 μm and always not greater than 2 μm.

The Examiner considers this feature to be disclosed in FIGS. 5A-5C and page 10, lines 15-30, of Im, stating as follows on page 3 of the Final Office Action of January 26, 2009:

> wherein a width of the overlapped portion of the first polycrystalline silicon is 1 μm (4 μm wide first irradiated portion and translation of 3 μm for an overlap of 1 μm, pg 10, lines 15-30), thus clearly suggests an overlapped portion always greater than 0.5 and always not greater than 2 μm.

However, these portions of Im merely disclose a single example in which a mask with slits having a width of 4 μm spaced 2 μm apart is translated by 3 μm after a first exposure, resulting in an overlapped portion of the polycrystalline silicon 540 having a width of 1 μm as shown in FIG. 5B of Im. It is submitted that Im does not disclose or suggest a method of manufacturing a polycrystalline silicon thin film in which a width of the overlapped portion is always greater than 0.5 μm and always not greater than 2 μm as recited in claims 1, 6, and 13 as alleged by the Examiner.

Page 8, lines 26-29, of Im states as follows:

> The width 240 of the slit 220 is preferably between approximately two and five micrometers in order to be small enough to avoid nucleation in sample 170 and large enough to maximize lateral crystal growth for each excimer pulse.

Also, page 9, line 28, through page 10, line 5, of Im states as follows:

> Each slit 410 should extend as far across on the mask as the homogenized laser beam 149 incident on the mask permits, and

> must have a width 440 that is sufficiently narrow to prevent any nucleation from taking place in the irradiated region of sample 170. The width 440 will depend on a number of factors, including the energy density of the incident laser pulse, the duration of the incident laser pulse, the thickness of the silicon film sample, and the temperature and conductivity of the silicon substrate. For example, the slit should not be more than 2 micrometers wide with a 500 Angstrom film is to be irradiated at room temperature with a laser pulse of 30 ns and having an energy density that slightly exceeds the complete melt threshold of the sample.

Thus, Im discloses that the width of the slits through which the laser beam passes is preferably between approximately 2 μm and 5 μm, and discloses a specific example of not more than 2 μm, and another specific example of 4 μm.

Page 3, lines 16-21, of Im states as follows:

> In an especially preferred arrangement, the masking step comprises masking portions of each homoginized [*sic*] fluence controlled laser pulse in the sequence with a two-dimensional pattern of substantially parallel straight slits of a predetermined width, spaced a predetermined distance being less than the predetermined width apart, and linearly extending parallel to one direction of the plane of homoginization [*sic*] to generate a sequence of fluence controlled pulses of slit patterned beamlets.

Also, page 10, lines 6-15, of Im state as follows:

> When the sample 170 is translated in the Y direction and mask 410 is used in masking system 150, a processed sample 450 having crystallized regions 460 is produced, as shown in Fig. 4b. Each crystal region 460 will consist of long grained, directionally controlled crystals 470. Depending on the periodicity 421 of the masking slits 420 in sample 410, the length of the grains 470 will be longer or shorter. In order to prevent amorphous silicon regions from being left on sample 170, the Y translation distance must be at least as long as the distance 421 between mask lines, and it is preferred that the translation be at least one micron greater than this distance 421 to eliminate small crystals that inevitably form at the initial stage of a directionally controlled polycrystalline structure.

Thus, although Im discloses that the distance between the slits is preferably less than width of the slits, Im does not disclose that the distance between the slits must be less than the slits, and does not disclose any minimum distance between the slits. Furthermore, although Im discloses an absolute minimum translation distance of not less than the distance between the

slits, and a preferred minimum translation distance of at least 1 μm more than the distance between the slits, Im does not disclose a maximum translation distance.

Thus, a slit width of 4 μm, a distance between the slits of 1 μm, and a translation distance of 2 μm would be covered by Im's disclosure, but would produce an overlapped width of 3 μm, which is outside the range of 0.5μm to 2 μm recited in claims 1, 6, and 13.

Accordingly, it is submitted that Im and Jung do not disclose or suggest the following feature of claims 1, 6, and 13 as alleged by the Examiner:

> wherein a width of the overlapped portion of the first polycrystalline silicon region measured perpendicularly to a boundary between the exposed portion of the amorphous silicon layer and the overlapped portion of the first polycrystalline silicon region is always greater than 0.5 μm and always not greater than 2 μm.

Furthermore, it is submitted that Im and Jung do not disclose or suggest the following feature of claims 1, 6, and 13:

> wherein an average width of polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is greater than approximately 0.2 μm and not greater than approximately 0.6 μm, and decreases as the width of the overlapped portion of the first polycrystalline silicon region decreases.

The Examiner states as follows on page 4 of the Final Office Action of January 26, 2009:

> The combination of Im et al [*sic*] and Jung does not teach the average width of the polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is greater than approximately 0.2 μm and not greater than approximately 0.6 μm and decreases as the width of the overlapped portion of the first polycrystalline silicon region increases. The combination of Im et al [*sic*] and Jung teaches an overlapped portion of 1 μm, which applicant teaches produces grain widths within the claimed range and overlapping more than 0.5 μm produces average grain widths of 0.2 μm or more, note applicant's Figure 3 and paragraph [0031]; therefore the claimed grain widths are expected.

However, although the Examiner has explained why he considers the combination of Im and Jung proposed by the Examiner provides the feature "an average width of polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is greater than approximately 0.2 μm" recited in claims 1, 6, and 13, the Examiner has not explained why he considers the combination of Im and Jung proposed by the Examiner to provide the feature "an average width of polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is . . . not greater than approximately 0.6 μm" recited in claims 1, 6, and 13, since the Examiner only refers to "average grain widths of 0.2 μm or more" in explaining the rejection. Accordingly, it is submitted that the Examiner has not established a *prima facie* case of obviousness with respect to claims 1, 6, and 13 and claims 3, 7, and 10 depending from claims 1 and 6.

Furthermore, assuming *arguendo* that the Examiner may arguably have intended to allege that the combination of Im and Jung proposed by the Examiner provides the feature "wherein an average width of polycrystalline silicon grains of the second polycrystalline silicon region measured perpendicularly to the width of the overlapped portion of the first polycrystalline silicon region is greater than approximately 0.2 μm and not greater than approximately 0.6 μm" recited in claims 1, 6, and 13, it is submitted that such an allegation would apparently be based solely on the Examiner's allegation that the combination of Im and Jung proposed by the Examiner provides the feature "wherein a width of the overlapped portion of the first polycrystalline silicon region measured perpendicularly to a boundary between the exposed portion of the amorphous silicon layer and the overlapped portion of the first polycrystalline silicon region is always greater than 0.5 μm and always not greater than 2 μm" recited in claims 1, 6, and 13. However, since Im and Jung do not disclose or suggest this feature of claims 1, 6, and 13 for at least the reasons discussed above, it is submitted that Im and Jung necessarily also do not disclose or suggest the average width of "greater than approximately 0.2 μm and not greater than approximately 0.6 μm" recited in claims 1, 6, and 13 as alleged by the Examiner.

For at least the foregoing reasons, it is respectfully requested that the rejection of claims 1, 3, 6, 7, 10, and 13 (i.e., claims 1, 6, and 13 discussed above and claims 3, 7, and 10 depending from claims 1 and 6) under 35 USC 103(a) as being unpatentable over Im in view of Jung be withdrawn.

If there are any additional fees associated with the filing of this paper, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

STEIN, MCEWEN & BUI, LLP

Date: 03/26/09

By: _____

Randall S. Svihla
Registration No. 56,273

1400 Eye St., NW
Suite 300
Washington, D.C. 20005
Telephone: (202) 216-9505
Facsimile: (202) 216-9510